

The Locations of Invasive Exotic Plants and the Effects of Treatment with Glyphosate at Seney National Wildlife Refuge

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Introduction

Invasive exotic plants often compete with native plants for space and resources. Invasive plants, once moved from their native habitat to a new location, spread rapidly on their own. This rapid rate of spread is possible because exotic species often possess characteristics that favor their population increase. These characteristics include early maturation, abundant production of seeds, long life of seeds in the soil, adaptation for spread, and production of toxins that suppress the growth of other plants (Van Driesche 2002). Furthermore, invasive plants often have no natural enemies in their new habitat to limit their reproduction and spread (Westbrooks 1998).

Invasive species have become a major concern in recent decades due in part to an increasing human population. Westbrooks (1998) states, “population growth leads to greater disturbance of the land, increased demand for food and fiber, overuse of public land for recreation and commercial production, increased international travel, and globalization of world trade. All of these encourage the introduction, establishment, and spread of invasive plants.” Invasive species threaten two-thirds of all endangered species, and are now considered to be an important threat to biodiversity (Westbrooks 1998).

Many invasive exotic plants have been identified at Seney National Wildlife Refuge. Some, like multiflora rose (*Rosa multiflora*), glossy buckthorn (*Rhamnus frangula*), and tartarian honeysuckle (*Lonicera tatarica*), were purposefully introduced. At the present, these three species present the greatest challenge to management at the Refuge (Petrella *et al.* 1999).

Multiflora Rose

Multiflora rose is an invasive plant native to eastern Asia (Voss 1985). It is identified by its arching canes and flowers or fruits present in clusters. The flowers range in color from white to pink. As it grows, multiflora rose crowds out native plants and can create an impenetrable wall. Due to its tolerance for a variety of conditions, as well as its production of up to a million

seeds per year, it spreads easily in disturbed areas (Petrella *et al.* 1999). After the removal of mature plants, seeds remain and can produce seedlings for at least 20 years (Amrine 2002).

Refuge records indicate that multiflora rose was planted at Seney in the early 1940s. Over 15,000 1-0 seedlings were planted along ditch banks, roadsides, and dikes (Seney Annual Narrative 1942). The plants were to serve as wildlife cover and as barriers along the roads. The Annual Narrative from 1942 states that, “the rose seedlings were set out in many situations in the uplands, mainly with the object of bettering the habitat for prairie chickens (*Tympanuchus cupido*) and sharp-tailed grouse (*Tympanuchus phasianellus*).” Also shown in the 1942 Annual Narrative are the locations of plantings. Locations include A Pool, B Pool, D Pool, Upper F Pool, J Pool, the Show Pools, C-2 Pool, T-2 Pool, Driggs River Road, and Tower Road (now Chicago Farm Road).

Today multiflora rose can be found along the east side of C-2 Pool, the southern part of D Pool, the southern edge of A-1 Pool, the north end of Driggs River Road, Chicago Farm Road, Refuge Entrance Road, Marshland Wildlife Drive, and around the Refuge Headquarters.

Glossy Buckthorn

Glossy buckthorn is a species native to Eurasia (Voss 1985). It grows as a small tree or tall shrub, ranging in height from 1.5 - 4+ m. It can be identified by its glossy dark green leaves and gray bark. The U.S. Forest Service considers glossy buckthorn a “Category One” invasive species because it is highly invasive, invades natural habitats, and replaces native species (USFS 1998). At the Refuge, glossy buckthorn invades wetlands and, when cut, resprouts vigorously (personal observation). It also consumes a large amount of water, which can lower the water table significantly (Devine 1999 in Petrella *et al.* 1999).

Glossy buckthorn is growing in many areas on the Refuge. Dense patches are located around the Refuge Headquarters and the Refuge Entrance Road, Visitor Center, Nature Trail, and along the Show Pool dikes. Other locations include the Marshland Wildlife Drive, C-2 Pool, H-E spillway, and J-I spillway.

Tartarian Honeysuckle

Tartarian honeysuckle is native to Eurasia, and was first collected in Michigan in the 1890s (Voss 1996). It is a deciduous shrub about 2 - 3 m tall. It is identified by its egg shaped

leaves, white to pink flowers, and presence of a hollow stem. Tartarian honeysuckle crowds out and competes with native plants. It can release a toxic chemical that prevents other plant growth.

Two thousand tartarian honeysuckle transplants were planted at Seney in 1943 (Seney Annual Narrative 1943). Their main use was as ruffed grouse (*Bonasa umbellus*) food and cover (Seney NWR Annual Narrative 1943). However, they were also thought to be attractive. Generally all tartarian honeysuckle is located around the Refuge Headquarters and the Visitor Center, with a few plants on the Marshland Wildlife Drive.

The purpose of this document is to 1) document where invasive plants were found and treated in 2004, 2) report on the suspected effectiveness of treating invasive species with glyphosate, and 3) provide the locations of invasive exotic plants for future management activities. The location maps produced from this report will serve as a guide for any future treatment of multiflora rose, glossy buckthorn, or tartarian honeysuckle on the Refuge. The maps could also aid in determining the long-term effects of the glyphosate treatment on invasive exotic plants.

Methods

To identify locations for treatment, maps from “A Survey of Invasive Exotic Plants in Seney National Wildlife Refuge” (Petrella *et al.* 1999) were used as an initial guide. These maps were the result of a survey alongside all Refuge roads for seven invasive species. Three of the species discussed by Petrella *et al.* (1999) were chosen for treatment: multiflora rose, glossy buckthorn, and tartarian honeysuckle. Two additional invasive plants, phragmites (*Phragmites australis*) and leafy spurge (*Euphorbia esula*), were treated when observed.

Additional locations were identified by observation or with help from Dr. Richard McNeill (Retired Professor, Ferris State University). Locations were treated by spraying a 5% glyphosate herbicide solution on the target plants. In some areas, treatment of glossy buckthorn occurred by cutting and applying a 20% glyphosate herbicide solution to the stump with a sponge applicator. This treatment was carried out with help from Erica Richards (Biological Technician) and Vince Cavalieri (Biology Intern).

Plants were treated in many locations, yet most work occurred on the Refuge Entrance Road and the Marshland Wildlife Drive. After treatment, plants at each site were monitored over

the field season to determine the rate of treatment effect. Mapping of all treated locations by species was done using ArcView GIS version 3.2.

Results

Treatment of multiflora rose was done at all locations where it was identified (Figure 1). Treated locations include: the east side of C-2 Pool, the southern part of D Pool, the Refuge Entrance Road, the Marshland Wildlife Drive, around the Refuge Headquarters and Shop, the southern edge of A-1 Pool, Chicago Farm Road, and the north end of Driggs River Road. Browning of the leaves began as soon as two days after application; although, it took up to four weeks until 75-100% of the foliage was brown (Table 1). After four weeks, plants with remaining green leaves were re-treated. Treated plants did not produce flowers.

Treatment of glossy buckthorn along the Show Pool dikes and on adjacent Department of Natural Resources (DNR) land consisted of cutting large plants and treating the stump by sponge application with a 20% glyphosate herbicide solution. Other locations were treated by spraying a 5% glyphosate herbicide solution on the target plants. Not all locations with identified glossy buckthorn could be treated due to time. The locations that were treated can be seen in Figure 2. Treatment of all identified glossy buckthorn was completed at C-2 Pool, the Marshland Wildlife Drive, the Refuge Entrance Road, and around the Refuge Headquarters. All other locations will require additional treatment. Treated glossy buckthorn had browning of leaves within one week, and by three weeks 100% of the foliage was brown (Table 2).

Tartarian honeysuckle located around the Refuge Headquarters was treated (Figure 3), but many plants were not originally identified and remain untreated. Instead of browning of leaves, as with multiflora rose and glossy buckthorn, tartarian honeysuckle leaves fell off the plant within one to two days of treatment (Table 3). After two weeks, any remaining leaves turned brown, as did any green stems.

Discussion

The treatment of plants during this field season is a small step in managing invasive exotic species on the Refuge. Although the treatment did have a negative effect on non-target species in the area, this was expected. The maps produced in this study are an update of the maps produced by Petrella *et al.* (1999). They include new locations and show the extent of each

species within most of Units 1 and 2 of the Refuge. Of the three species treated, glossy buckthorn is the most abundant, yet the majority of the plants occur in Unit 1. Multiflora rose can be found in equal amounts in Unit 1 and Unit 2. Tartarian honeysuckle is limited to the area around the Refuge Headquarters and Visitor Center.

Many other invasive and exotic plants occur at Seney NWR. Petrella *et al.* (1999) found that 35 species of invasive plants have been documented at the Refuge (Table 4). Treatment of invasive and exotic plants, as well as monitoring for new plants is necessary to successfully manage them. A second treatment of sprayed areas was necessary to kill any plants missed. In the future re-treatment of multiflora rose, glossy buckthorn, tartarian honeysuckle, leafy spurge, and phragmites locations treated this field season may be necessary, and is recommended. Constant treatment and monitoring of new growth is needed to keep these invasive species under control.

Works Cited

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Appendix

Figure 1 - Locations where multiflora rose was treated at Seney National Wildlife Refuge (2004).

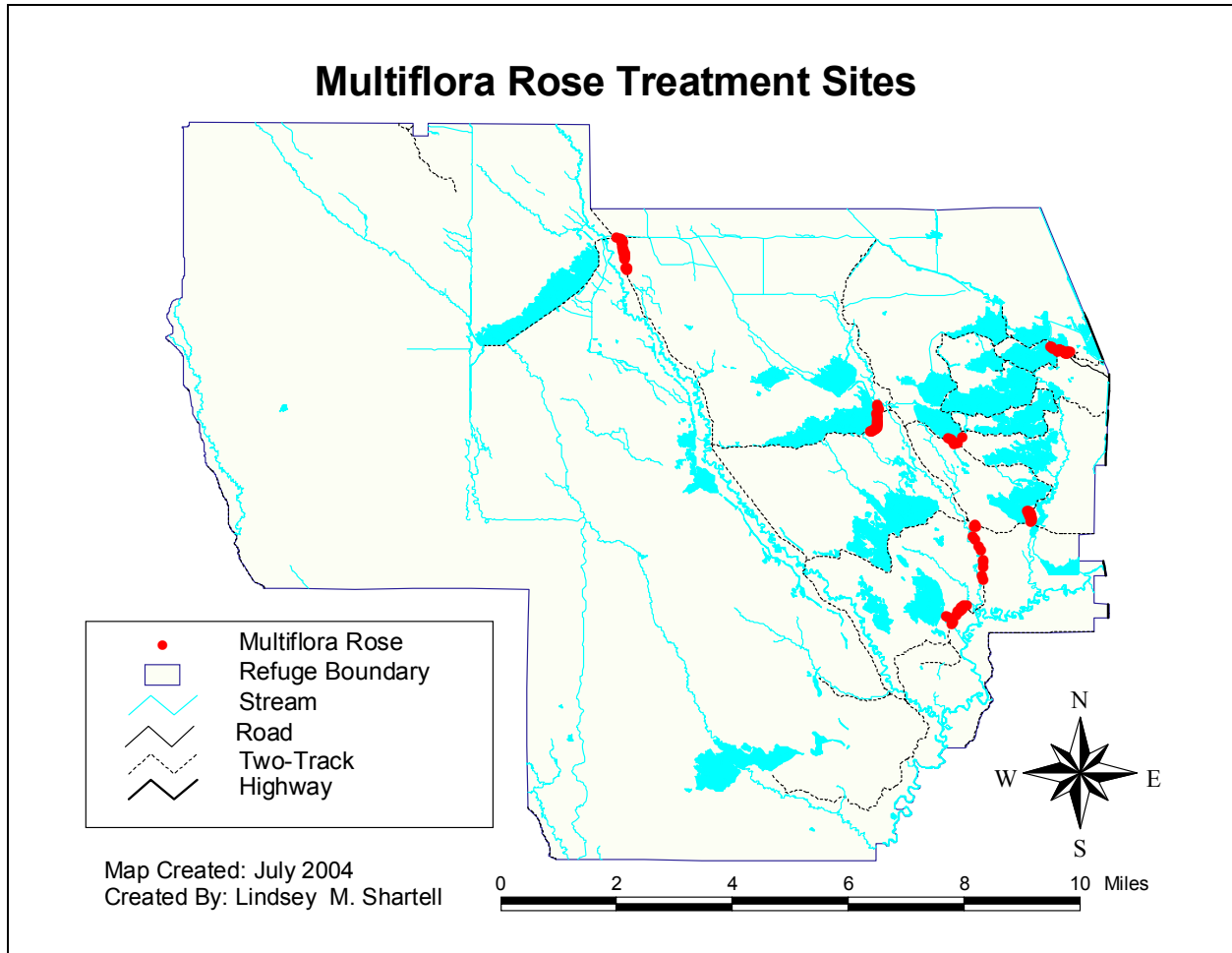


Table 1 - Percent brown leaves over time of treated multiflora rose at Seney National Wildlife Refuge (2004).

#	Location	Date Treated	1 Week	2 Weeks	3 Weeks	4 Weeks
1	Chicago Farm Rd	15 June 2004	> 25%	25%	75%	100%
2	East edge of C-2	15 June 2004	25%	75%	100%	-
3	East edge of C-2	23 June 2004	> 25%	25%	25%	75%.
4	A-1	30 June 2004	> 25%	75%	100%	-
5	A-1	30 June 2004	25%	75%	100%	-
6	Wildlife Drive	24 June 2004	> 25%	25%	75%	75%

Figure 2 - Locations where glossy buckthorn was treated at Seney National Wildlife Refuge (2004).

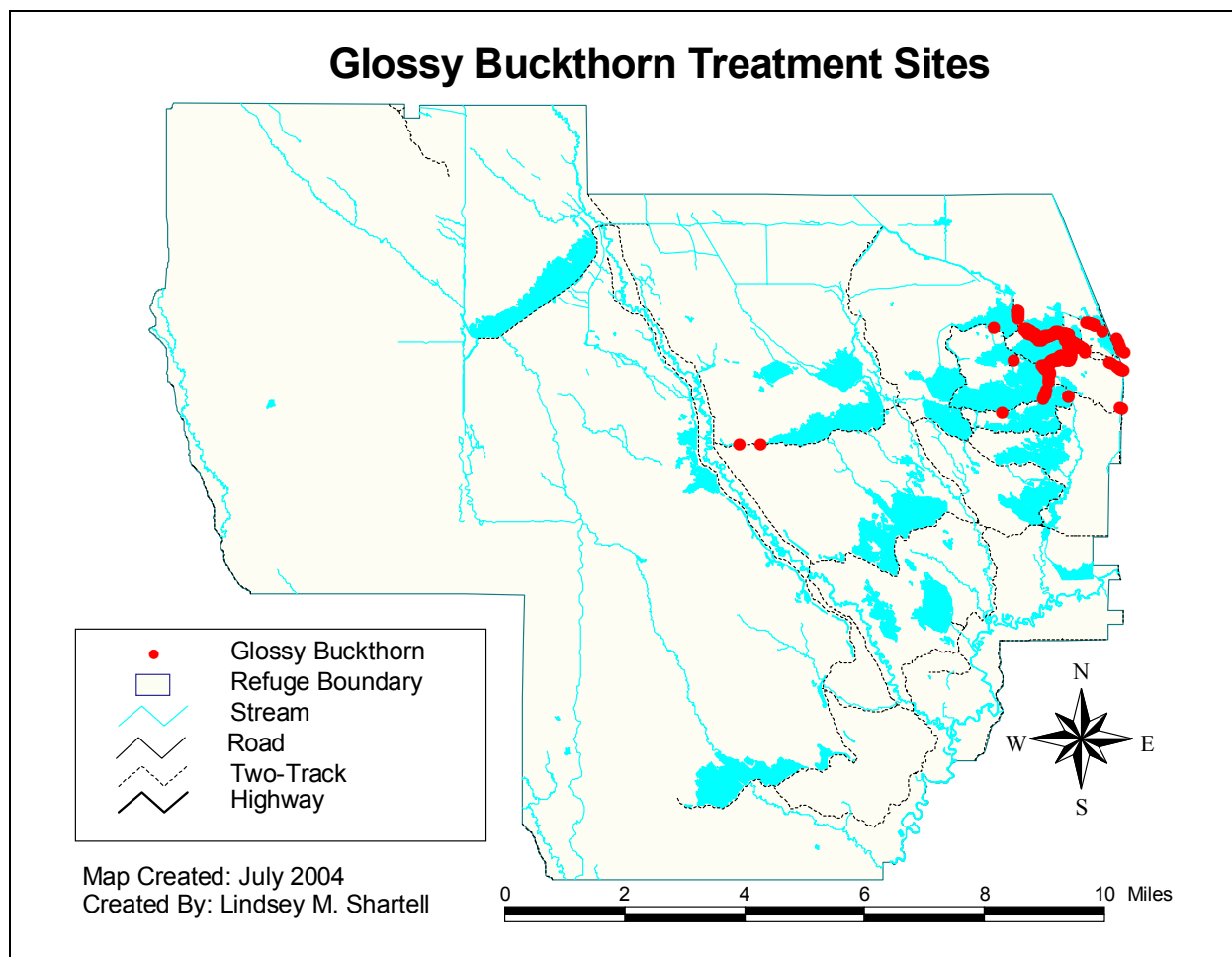


Table 2 - Percent brown leaves over time of treated glossy buckthorn at Seney National Wildlife Refuge (2004).

#	Location	Date Treated	1 Week	2 Weeks	3 Weeks
1	Quarters 1	21 June 2004	>25%	75%	100%
2	Fishing Loop J Pool	1 July 2004	>25%	50%	100%

Figure 3 - Locations where tartarian honeysuckle was treated at Seney National Wildlife Refuge (2004).

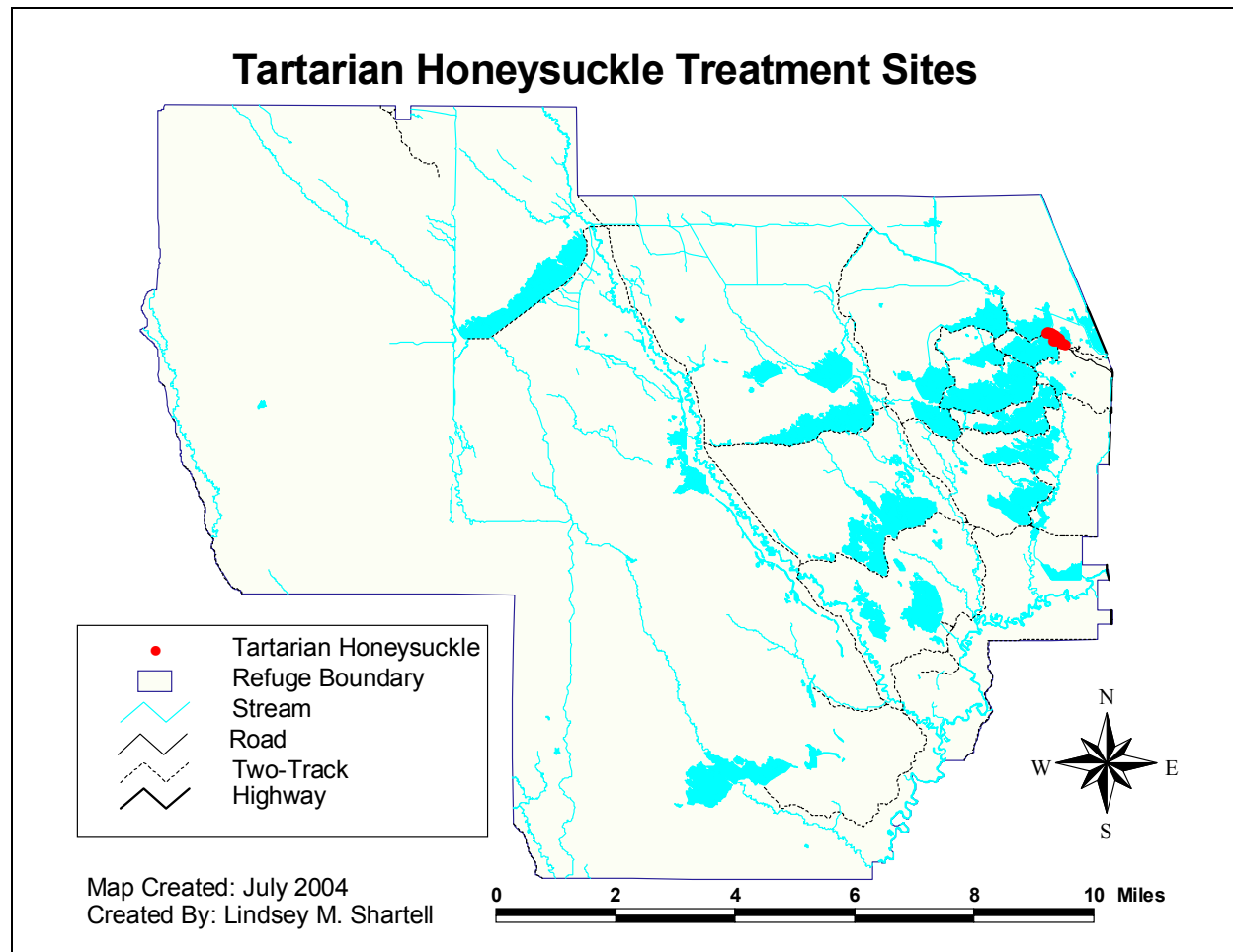


Table 3 - Effects of treatment on tartarian honeysuckle at Seney National Wildlife Refuge (2004).

#	Location	Date Treated	After 1 Week	After 2 Weeks
1	Near Fire Tower	29 June 2004	75% of leaves have fallen off.	Remaining leaves have turned brown. Green stems have turned brown.
2	Quarters 1	29 June 2004	75% of leaves have fallen off. Some berries were produced.	Remaining leaves have turned brown. Green stems have turned brown.

Table 4 - Invasive exotic species found at Seney National Wildlife Refuge.

Scientific Name	Common Name	Scientific Name	Common Name
<i>Berberis thunbergii</i>	Japanese Barberry	<i>Melilotus officinalis</i>	Yellow Sweet-Clover
<i>Bromus inermis</i>	Smooth Brome	<i>Nepeta cataria</i>	Catnip
<i>Capsella bursa-pastoris</i>	Shepard's Purse	<i>Phalaris arundinaceae</i>	Reed Canary Grass*
<i>Centaurea maculosa</i>	Spotted Knapweed*	<i>Phleum pratense</i>	Timothy
<i>Chrysanthemum leusanthemum</i>	Ox-eye Daisy	<i>Plantago major</i>	Plantain
<i>Cirsium arvense</i>	Canada Thistle	<i>Poa pratensis</i>	Kentucky Bluegrass
<i>Dactylis glomerata</i>	Orchard Grass	<i>Potentilla argentea</i>	Silvery Cinquefoil
<i>Daucus carota</i>	Queen Anne's Lace	<i>Prunella vulgaris</i>	Heal-All
<i>Euphorbia esula</i>	Leafy Spurge*	<i>Ranunculus acris</i>	Tall Buttercup
<i>Hieracium aurantiacum</i>	Orange Hawkweed	<i>Rhamnus frangula</i>	Glossy Buckthorn*
<i>Hypericum perforatum</i>	St. John's Wort	<i>Rosa multiflora</i>	Multiflora Rose**
<i>Linaria vulgaris</i>	Butter-and-Eggs	<i>Sedum telephium</i> (<i>purpureum</i>)	Live-Forever
<i>Lolium perenne</i>	Ryegrass	<i>Silene vulgaris</i>	Bladder Campion
<i>Lonicera tatarica</i>	Tartarian Honeysuckle*	<i>Sonchus arvensis</i>	Field Sow-Thistle
<i>Lotus corniculata</i>	Bird's Foot Trefoil	<i>Tragopogon pratensis</i>	Yellow Goat's-Beard
<i>Malva moschata</i>	Musk Mallow	<i>Trifolium repens</i>	White Clover
<i>Lythrum salicaria</i>	Purple Loosestrife*	<i>Verbascum thapsus</i>	Giant Mullein
<i>Melilotus alba</i>	White Sweet-Clover		

***Category One: Highly Invasive **Category Two: Moderately Invasive**

Adapted from "A Survey of Invasive Exotic Plants in Seney National Wildlife Refuge" (Petrella *et al.* 1999)